

5 CLAIMS

1. Apparatus for determining the presence of a fluid conduit (5) and at least one characteristic of the content of the fluid conduit (5), the apparatus being
10 disposed on a control device, for example for the extracorporeal treatment of blood, and comprising a light source (26), the radiation (50) of which is directed towards the fluid conduit (5) and through the same, and an optical sensor (30) that detects the radiation (50)
15 emitted by the light source (26) and transmitted through the fluid conduit (5), characterised by a second optical sensor (28), that detects radiation (52) emitted by the light source (26) and reflected by the fluid conduit (5).
- 20 2. Apparatus according to claim 1, characterised in that the second optical sensor (28) is formed integrally with the light source (26).
- 25 3. Apparatus according to claim 1 or 2, characterised in that the apparatus is arranged with at least its electrical components (22, 24, 26, 28, 30) in a housing (32) of the control device.

4. Apparatus according to any previous claim,
characterised in that there is provided a first waveguide
(40) that transmits light (50) from the light source (26)
5 to the fluid conduit (5), and transmits back light (52)
reflected by the fluid conduit (5) to the second optical
sensor (28), and a second waveguide (42) that transmits
light directed towards the fluid conduit (5) and
transmitted through the same towards the first optical
10 sensor (30).

5. Apparatus according to claim 4, characterised in
that the apparatus comprises a conduit holder (34)
arranged on the housing (32) of the control device, the
15 first and second waveguides (40, 42) being integrated in
the conduit holder (34).

6. Apparatus according to claim 4 or 5,
characterised in that the first waveguide (40) is
20 arranged such that an air gap is formed between the fluid
conduit (5) and the first waveguide (40).

7. An apparatus according to any previous claim,
characterised in that the light source (26) emits
25 radiation with a defined wavelength and a defined
modulation.

8. An apparatus according to claim 7, characterised
in that the light source (26) emits radiation in the
30 infrared wavelength region in an essentially square pulse
sequence.

9. An apparatus according to any previous claim,
characterised in that the first and second sensors (30,
28) are electrically connected to a control unit (13) of
5 the control device.

10. An apparatus according to claim 9, characterised
in that the control unit (13) is formed such that it
compares the signals supplied by both sensors (30, 28)
10 with predetermined values, and determines that

- no fluid conduit (5) is present when the signal from
the first sensor (30) is at a high level and the signal
from the second sensor (28) is at a low level,
- a fluid conduit (5) is present and empty when the
15 signal from the first sensor (30) is at a medium level
and the signal from the second sensor (28) is at a high
level,
- a fluid conduit (5) is present and filled with
transparent fluid when the signal from the first sensor
20 (30) is at a high level and the signal from the second
sensor (28) is at a high level,
- a fluid conduit (5) is present and filled with blood
when the signal from the first sensor (30) is at a low
level and the signal from the second sensor (28) is at a
25 high level,
- a fluid conduit (5) is present and filled with blood
and the blood contains air bubbles when the signal from
the first sensor (30) is at a low level and the signal
from the second sensor (28) is at a high level, and the
30 signal from the first sensor (30) comprises pulses at a
high level,

- an error condition exists when the signal from the first sensor (30) is at a low or medium level and the signal from the second sensor (28) is at a low level.

5 11. An apparatus according to any of the previous claims, characterised in that the control device, on which the apparatus is arranged, is a dialysis monitor.

10 12. A method for determining the presence of a fluid conduit (5) and at least one characteristic of the content of the fluid conduit (5), the method being utilised in a control device, such as for the extracorporeal treatment of blood, and in which radiation (50) from a light source (26) is directed towards the
15 fluid conduit (5) and transmitted through the same, and an optical sensor (30) detects light emitted by the light source (26) and transmitted through the fluid conduit (5), characterised in that the radiation (52) emitted by the light source (26) and reflected by the fluid conduit
20 (5) is detected by a second optical sensor (28).

13. A method according to claim 12, characterised in that the signals supplied by both sensors (30, 28) are sent to a control unit (13) that compares the signals
25 with predetermined values and determines that

- no fluid conduit (5) is present when the signal from the first sensor (30) is at a high level and the signal from the second sensor (28) is at a low level,
- a fluid conduit (5) is present and empty when the
30 signal from the first sensor (30) is at a medium level and the signal from the second sensor (28) is at a high

- level,
- a fluid conduit (5) is present and filled with transparent fluid when the signal from the first sensor (30) is at a high level and the signal from the second sensor (28) is at a high level,
 - a fluid conduit (5) is present and filled with blood when the signal from the first sensor (30) is at a low level and the signal from the second sensor (28) is at a high level,
 - 10 - a fluid conduit (5) is present and filled with blood and the blood contains air bubbles when the signal from the first sensor (30) is at a low level and the signal from the second sensor (28) is at a high level, and the signal from the first sensor (30) comprises pulses at a
 - 15 high level,
 - an error condition exists when the signal from the first sensor (30) is at a low or medium level and the signal from the second sensor (28) is at a low level.

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